

2. Microphones

Objectives

- Identify the differences between **dynamic and condenser** microphones in terms of **sound generation, benefits and drawbacks**
- Understand and use the terms **transducer** and **electromagnetic induction**

Skills Development

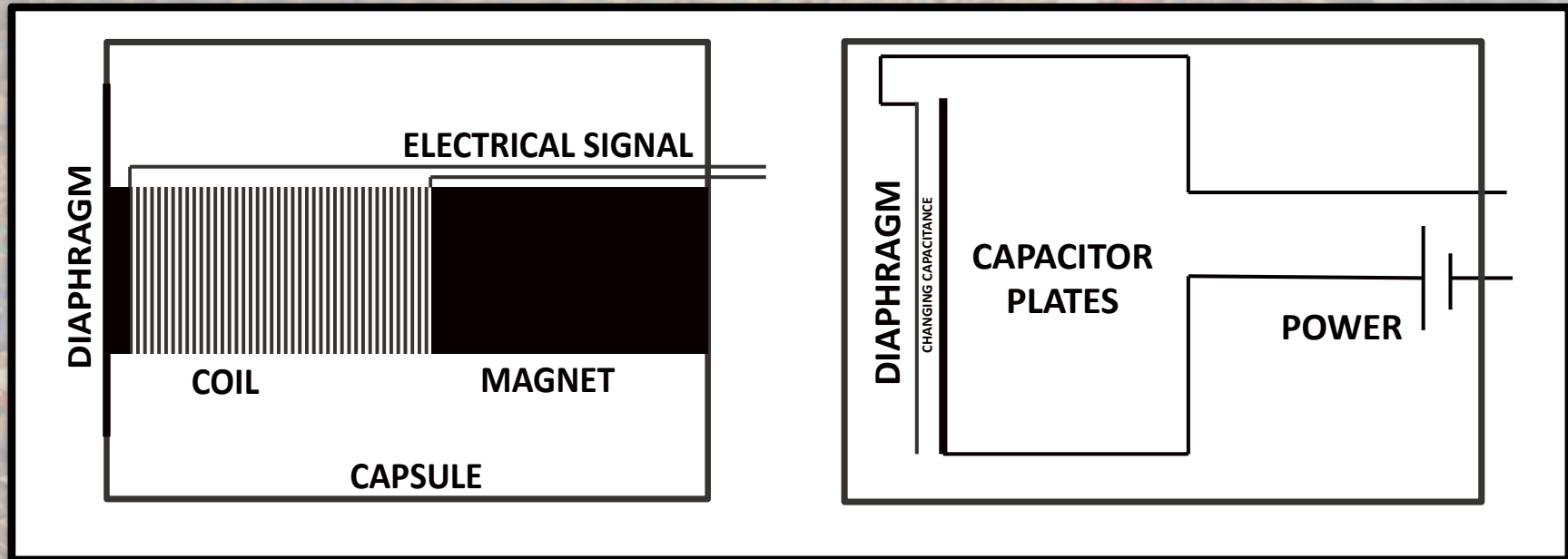
- Commercial Awareness
(dynamic or condenser?)

Key Words

Transducer
Coil
Diaphragm
Condenser
Dynamic
Ribbon
PZM
Electret
Polar Pattern
Electromagnetic Induction
Proximity Effect
Frequency Response
Plosive
Sibilant

2. Microphones

- A microphone is a **transducer** that **converts between sound and electrical energy**.
- There are two important types of microphone; **dynamic** and **condenser**.

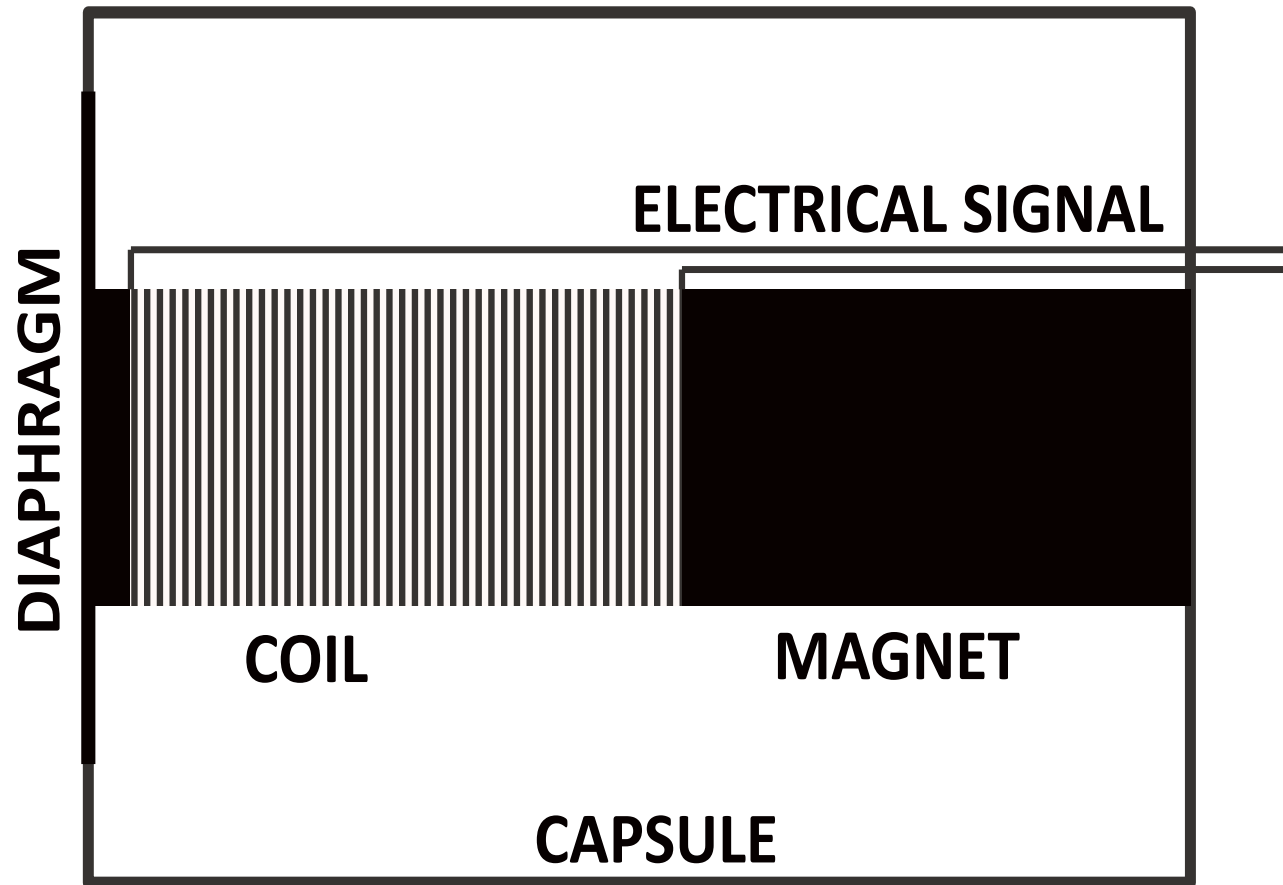


2. Microphones

- **Dynamic microphones** use electromagnetic induction to capture a sound signal.
- The sound **causes the vibration of the diaphragm**, which causes the **magnet to move through the coil**.
- This **induces an electrical current** in the coil that is **proportional to the disturbance** of the diaphragm.

2. Microphones

Diagram of a Dynamic Microphone



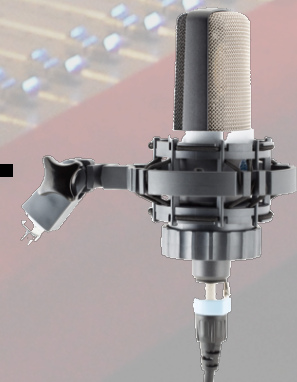
2. Microphones

- Dynamic microphones are **often used for sources with a high SPL** (sound pressure level, or volume).
- They are **robust** and often **relatively inexpensive**, and **don't require phantom power**.
- However, their **high frequency response** is often **worse** than condensers & they have a **low output volume**.



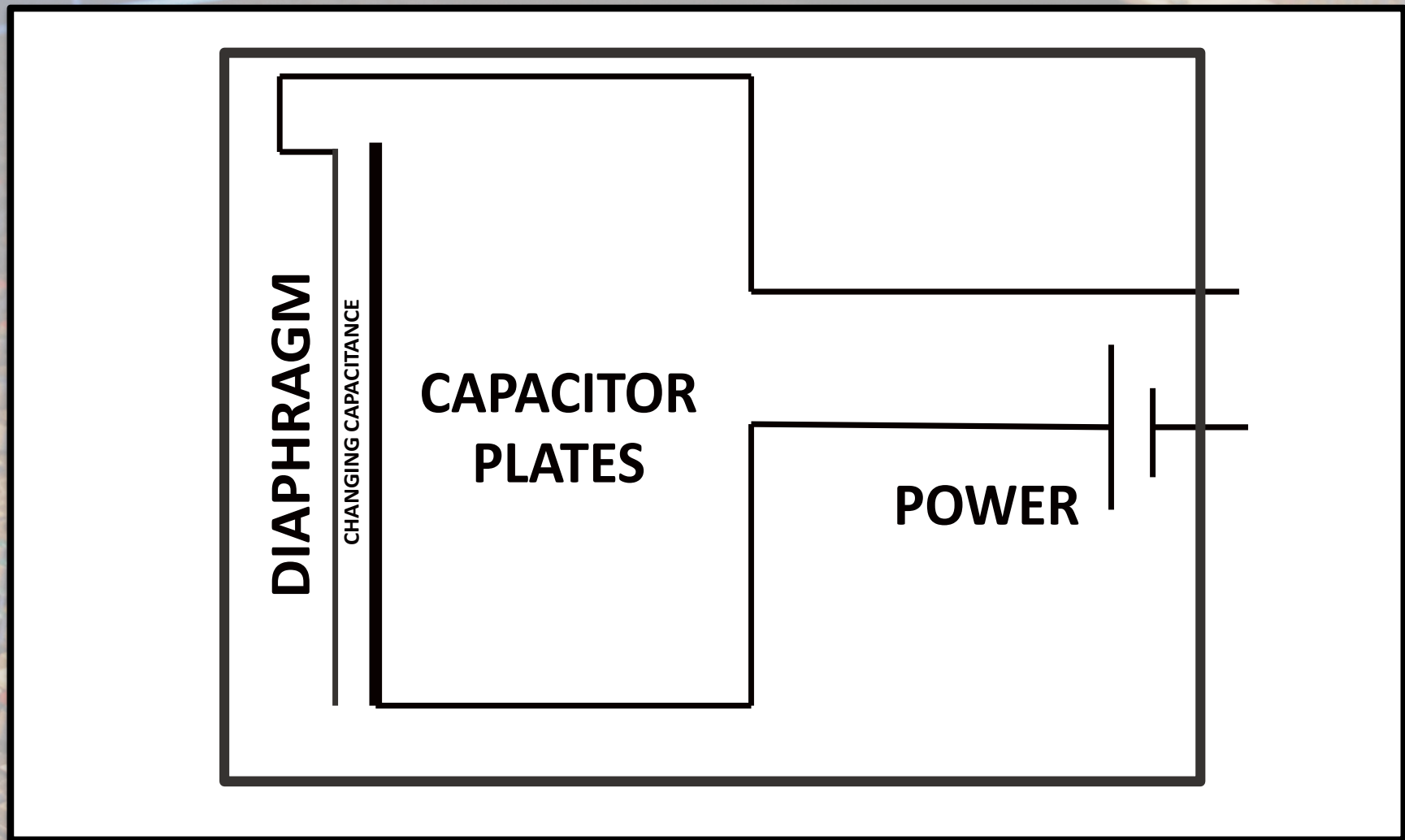
2. Microphones

- **Condenser microphones** use a capacitor to capture sound.
- The sound causes the **vibration of the diaphragm**, which is **one plate of a capacitor**.
- As the capacitor plates are **powered**, moving the **diaphragm causes a change in capacitance** & thus a **current flows**.



2. Microphones

Diagram of a Condenser Microphone



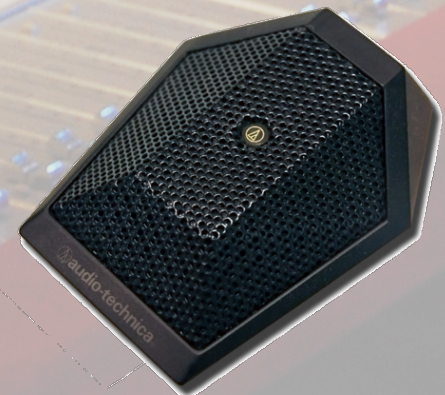
2. Microphones

- Condenser microphones are often **used for studio work** as they have a **wide and flat frequency response** and **capture high frequencies well**.
- They are very **sensitive**.
- However, because the capacitor needs powering, condenser microphones require **phantom power** or a battery, and can be quite **expensive and fragile**.

2. Microphones

Other Types of Microphone

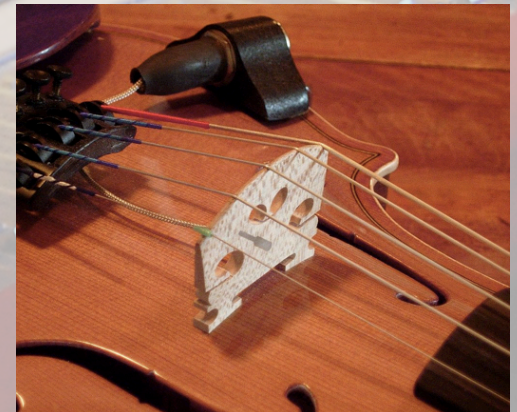
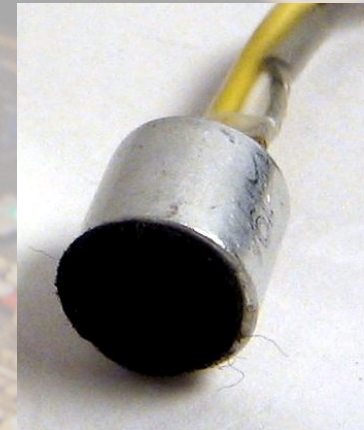
- **Ribbon microphones** are expensive, delicate and used for high quality, accurate recordings
- **PZM microphones** are pressure zone microphones, and used to capture reflections



2. Microphones

Other Types of Microphone

- **Electret microphones** are cheaper condensers that have a permanently charged plate
- **Contact microphone** are often used as pickups on acoustic instruments



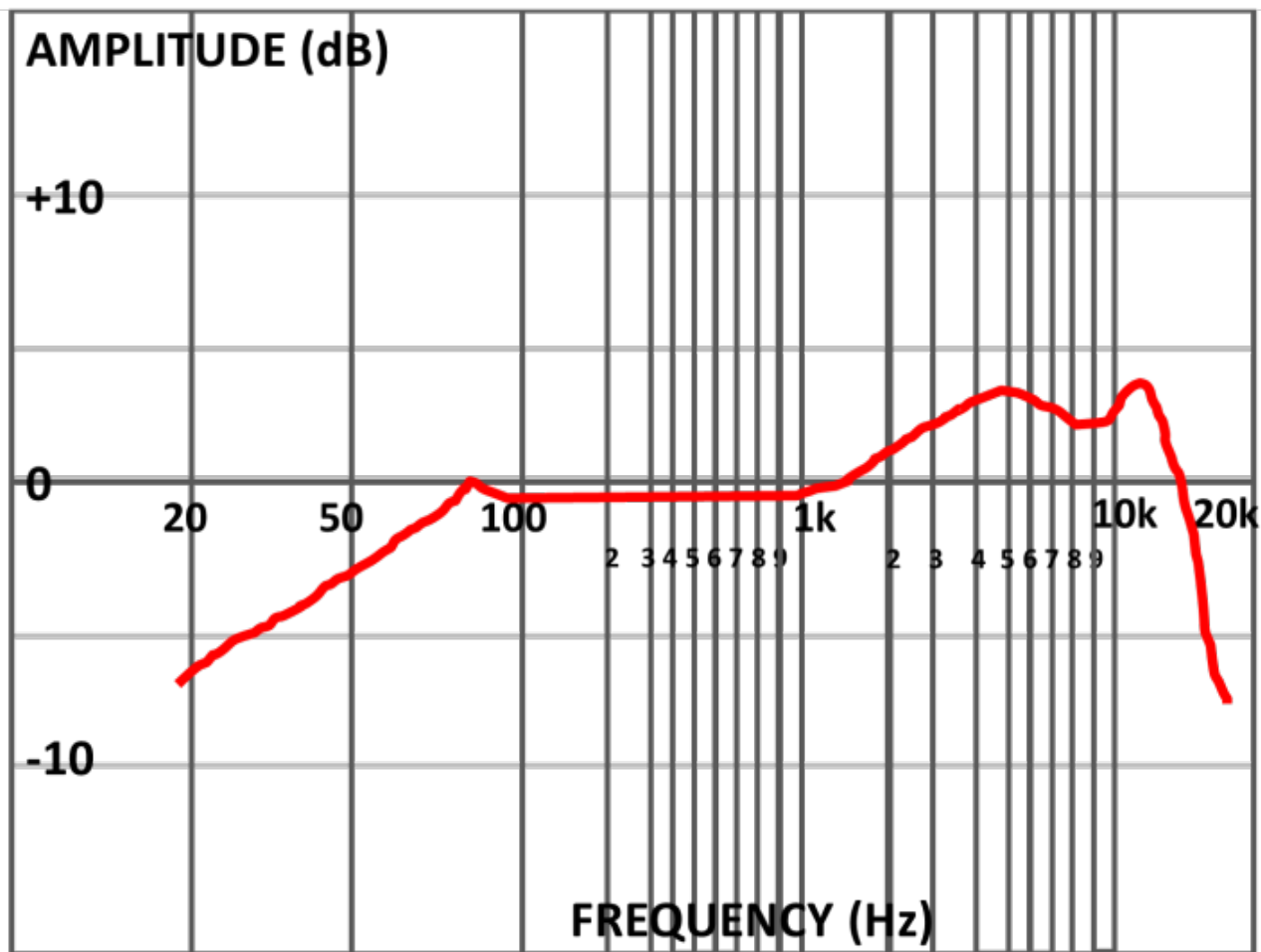
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Frequency and Transient Response

- A microphone's **frequency response** tell us the frequencies it picks up **in relation to the human hearing range**. It is common to see a graph of a microphone's frequency response.
- The flatter the graph, the more '**true**' the sound is. If a graph has any particular peaks, this means that those frequencies are **captured louder** than they are in 'real-life'. This is colouration.

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Frequency and Transient Response



2. Microphones

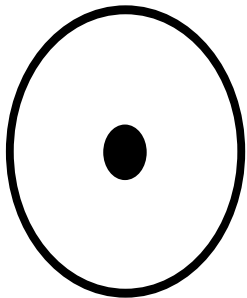
Frequency and Transient Response

- A microphone's **transient response** is how quickly the **diaphragm can move** when disturbed by a vibration.
- **Large diaphragm condenser microphones** tend to have a fast transient response.

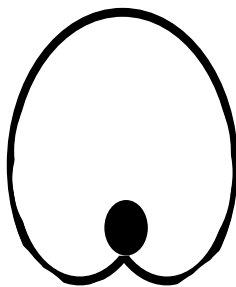
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Polar Pattern

- A microphone's **polar pattern** is how it picks up sound from around the capsule. There are four main polar patterns:



Omnidirectional



Cardioid

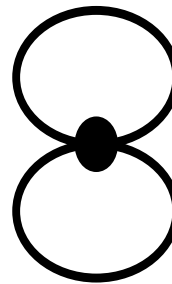
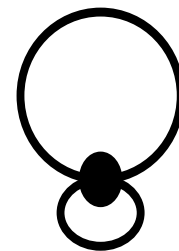


Figure-of-Eight



Hypercardioid

2. Microphones

Recording with Microphones

- The **proximity effect** is when **low frequencies are emphasised** when you get **closer** to the microphone.
- This can be fixed by **moving further back** or by **using EQ** later on.
- Sometimes this effect is used to give a **‘warmer’ sound**

2. Microphones

Recording with Microphones

- **Plosive sounds** cause a big disturbance in a microphone's diagram causing a '**pop**' sound. Sounds like 'p' and 'd' are particularly bad for this. A **pop shield** can be used to avoid such issues.
- **Sibilance** is 's'-like sounds which jump through the mix. Some engineers **tape a pencil** to the microphone to avoid this, or a **deesser** can be used in production.